

A survey of the *Eupithecia* fauna (Lepidoptera, Geometridae) of the Western Himalayas: Part I

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Abstract In the three parts of this paper to be published, 80 species of *Eupithecia* (Lepidoptera, Geometridae) are recorded for the fauna of Kashmir and adjacent territories of Pakistan and India, more than doubling the previously recorded total. The type specimens of the majority of these species were studied; lectotypes are designated where appropriate. Fourteen new species and one new subspecies of *Eupithecia* are described; one taxon (*Eupithecia mesodeicta* Prout, 1938) is raised, and three restored, to species rank; 30 species names are synonymised and a large number of species are recorded as new for the fauna of Kashmir or adjacent areas of Afghanistan, Pakistan, and India.

Key words Kashmir (Pakistan/India), Eupitheciini (Lepidoptera, Geometridae), revision, taxonomy, synonymy, distribution, new species, *Eupithecia phaea* Mironov & Galsworthy, sp. n., *Eupithecia dalhousiensis* Mironov & Galsworthy, sp. n., *Eupithecia thomasi* Mironov & Galsworthy, sp. n., *Eupithecia vinibua* Mironov & Galsworthy, sp. n., *Eupithecia karli* Ratzel & Mironov, sp. n., *Eupithecia bestia* Mironov & Galsworthy, sp. n.

Introduction

The genus *Eupithecia* Curtis, 1825 is one of the most species-rich genera of the family Geometridae, and is particularly rich in the Himalayas. This area was fairly well collected in the late nineteenth and early twentieth centuries, and a limited number of species of *Eupithecia* were identified or described from the area. Much material however remained unidentified. Only sporadic further work on this aspect was done after the second world war, but recent work (Inoue, 2000), based on Japanese collecting expeditions, has thrown considerable light on the fauna of Nepal. However the fauna of areas further to the north and west, running through Uttaranchal, Himachal Pradesh, Jammu and Kashmir to the Northern Areas of Pakistan, and the North West frontier province of Pakistan is still not well documented. This area is subsequently referred to in this paper as the ‘western Himalayas’. The purpose of this paper is to survey and revise the known *Eupithecia* fauna of this region, and to publish new data arising from recent collecting activity, and re-examination of older collections. This geographical division is an artificial one, but that is perhaps inevitable when dealing with an area of this size and complexity.

In earlier publications (Warren, 1888, 1896; Butler, 1889; Hampson, 1895, 1902, 1903) 15 species, which were subsequently placed in the genus *Eupithecia*, were described from Pakistan (Thundiani, Kokser, Berham Gully), Kashmir (Goorais Valley) and North India (Himachal Pradesh: Dharmsala, Dalhousie, Kasauli). They were: *Eupithecia quadripunctata*, *Cidaria subrubescens*, *Eupithecia atrisignis*, *Melanippe decipienda*, *Eupithecia fulvipennis*, *Eupithecia lucigera*, *Eupithecia acutangula*, *Eupithecia conjunctiva*, *Eupithecia hemileuca*, *Eupithecia latimedia*, *Eupithecia subtacincta*, *Tephroclystia nigrilinea*, *Phibalapteryx interrubescens*, *Eupithecia incurvaria* and *Eupithecia thermosaria*. Subsequently 4 new species and 3 new subspecies of *Eupithecia* were described by Prout (1926, 1938, 1958) from Kashmir (Gulmarg), Himachal Pradesh (Dalhousie, Simla) and

Uttar Pradesh (Kumaon): *E. fletcheri*, *E. propagata*, *E. acolpodes*, *E. fletcheri hypognampta*, *E. lariciata mesodeicta*, *E. lineosa gulmargensis* and *E. albigutta*. However, despite the considerable work done by British entomologists on this subject, it was by no means exhausted: 6 species of *Eupithecia* were described as new from Pakistan (Swat) and India (Kumaon) by Vojnits (1981): *E. comparanda*, *E. producta*, *E. ingrata*, *E. infecunda*, *E. repetita* and *E. invicta*, and also one Chinese species *E. likiangi* Vojnits, 1976 was recorded from North India (Kumaon). Not long afterwards, Dr H. Inoue (1996) described four new species of this genus (*E. emikoe*, *E. aspectabilis*, *E. emittens* and *E. subolivacea*) from Kashmir and Pakistan (Baltistan and Gilgit) as additions to the rich but still poorly known fauna of *Eupithecia* of this Asian region.

Taking all this together, 32 species of the genus (taking account of previously established synonymy) have been recorded from the western Himalayas up to the present time. The three parts of the present paper, which record 80 species, will therefore more than double the known fauna.

This paper is based both on a re-examination of the extensive collection in the Natural History Museum, London, and on material intensively collected, mainly over the past twenty to thirty years by †Dr W. Thomas (Bad Nauheim, Germany), G. Ebert (Karlsruhe, Germany), by the Hungarian entomologists, Dr L. Ronkay, G. Ronkay, Gy. M. László, B. Herczig, G. Csorba, Z. Varga, M. Hreblay, and Gy. Fábíán (Budapest, Hungary) and by a number of other collectors.

Under each species name, for convenience, we list material examined under three headings, 'type', 'older', which refers to material collected before the second world war, and 'recent', which refers to the material detailed in the previous paragraph.

The territory of Kashmir continues to be in dispute between Pakistan and India: in listing material we therefore give the original data from the labels under each specimen, many of which were collected before partition. No political statement is intended thereby. Where reference is made to the 'fauna of Kashmir', it is to the whole strictly geographical territory, covering both parts of divided Kashmir.

This paper goes beyond a faunistic list, and constitutes a revision of the members of the genus *Eupithecia* found in Kashmir and adjacent areas. We have been able to locate and examine almost all of the original type material used by W. Warren, A. G. Butler, G. F. Hampson, L. B. Prout (BMNH, London), O. Staudinger, O. Bohatsch, K. Dietze (MNHU, Berlin), E. Schütze (ZSM, Munich), A. Vojnits (SMNK, Karlsruhe; TTM, Budapest; ZISP, Saint Petersburg), J. Viidalepp (IZBE, Tartu; ZISP, Saint Petersburg) and H. Inoue (BMNH, London). As a result, in the three parts of this paper fourteen new species and one new subspecies are described, one taxon is raised for the first time from subspecific to specific rank, and three are restored to the same position, 30 species names are synonymised, and a large number of species are recorded for the first time from this area. A full list of taxonomic changes will be published with the third part of the paper.

Space prevents the inclusion of habitus and genitalia figures for all species treated, but we have aimed in this paper to illustrate not only the new species described, but also older species which have not been figured in recent publications.

We are grateful to Dr A. Hausmann (ZSM, Munich), Dr D. Stüning (ZFMK, Bonn), Dr W. Mey (MNHU, Berlin), Dr R. Trusch, Mr G. Ebert and Mr G. Petschenka (SMNK, Karlsruhe), Dr Chr. Häuser (SMNS, Stuttgart), Dr L. Ronkay and Mr Gy. M. László (HNHM, Budapest), Mr I. Yu. Kostjuk (ZMKU, Kiev), and Dr M. Owada (NSMT, Tokyo)

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Abbreviations. BMNH: The Natural History Museum, London, United Kingdom; MNHU: Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin, Germany; ZFMK: Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany; ZSM: Zoologisches Staatssammlung München, Germany; SMNK: Staatliches Museum für Naturkunde, Karlsruhe, Germany; SMNS: Staatliches Museum für Naturkunde, Stuttgart, Germany; TTM: Termesztudományi Múzeum Allattara (Hungarian Natural History Museum), Budapest, Hungary; NHRS: Naturhistoriska Riksmuseet, Stockholm, Sweden; MHMW: Naturhistorisches Museum Wien, Austria; ZISP: Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia; IAET: Institute of Agriculture and Environment, Estonian Agricultural University, Tartu, Estonia; NSMT: National Science Museum, Tokyo, Japan; EIHU: Entomological Institute, Hokkaido University, Sapporo, Japan; ZMKU: Zoological Museum, National Shevchenko University, Kiev, Ukraine; ZMMU: Zoological Museum, Moscow State University, Russia; coll. László: coll. Gyula M. László, Budapest; coll. Ratzel: coll. Ulrich Ratzel, Karlsruhe.

Eupithecia subtacincta Hampson, 1895

Eupithecia subtacincta Hampson, 1895, *Fauna Br. India* (Moths) **3**: 399.

Eupithecia tabidaria Inoue, 1955, *Tinea* **2**: 82. **Syn. n.**

Eupithecia ussuri Vojnits, 1972, *Annls hist.-nat. Mus. natn. hung.* **64**: 301. [Originally as subsp. of *Eupithecia gozmanyi* Vojnits, 1972]

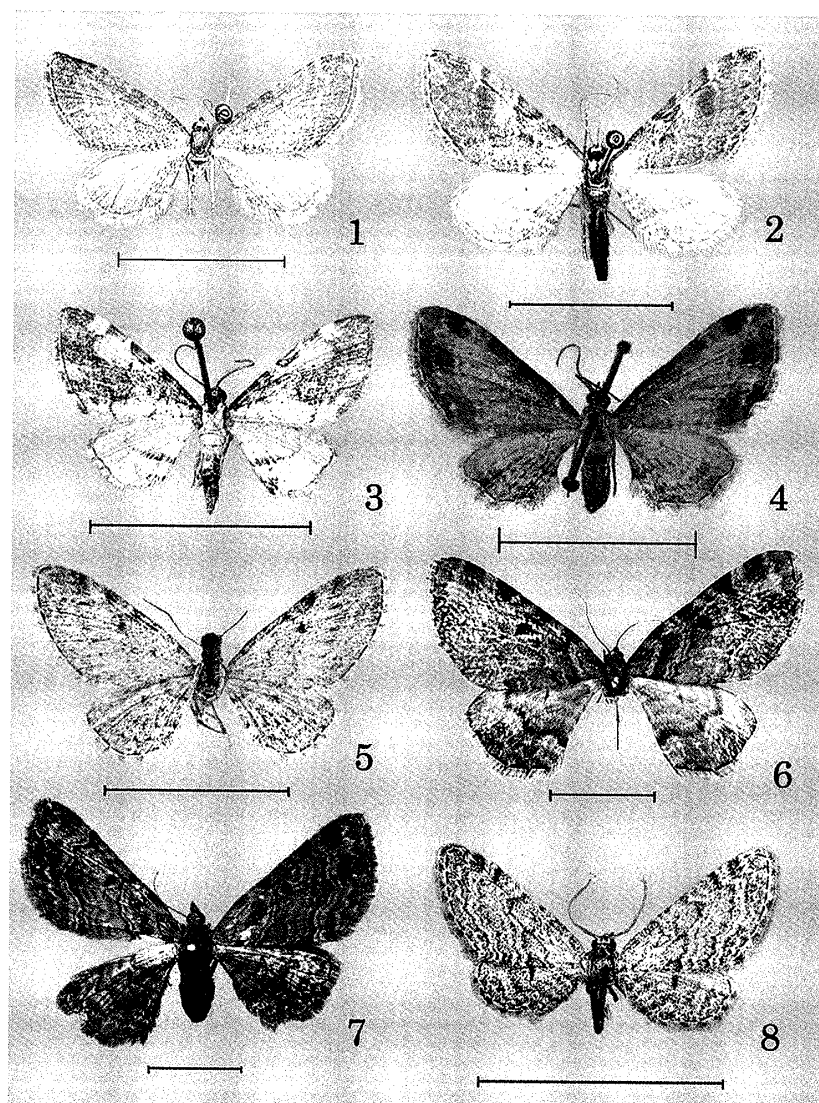
Eupithecia minibursae Vojnits, 1973, *Annls hist.-nat. Mus. natn. hung.* **65**: 252, fig. 3a.

Unavailable names (incorrect subsequent spelling): *gozmanyi ussuriensis*: Vojnits (1973).

A widespread Asian species, occurring from the Himalayan region through China to the Russian Far East.

Examined type material. ♀, [India] Dharmasala, BM Geom. slide no 20931, (holotype of *E. subtacincta*) (BMNH); ♂, [Japan], Takao-san, 30. vii. 1949, H. Inoue (holotype of *E. tabidaria*) (coll. Inoue in BMNH); ♀, [Russia], Wladiwostock occ., Ussuri, Sutschanski-Rudnik, August, 817, Vojnits slide no 524 (holotype of *E. gozmanyi ussuri*) (ZFMK); ♀, [Russia], Sutshan, Ussuri, Vojnits slide no 521 (holotype of *E. minibursae*) (ZFMK): the specimen also bears an erroneous label, "*Eupithecia asperata* Brdt."

Recent material. 11 ♀, Indien, J & K, Kaschmir, vic. Srinagar, 1,900 m, 3. viii. 1986, leg. W. Thomas (ZFMK); 2 ♀, Indien, J & K, Ladakh, Kharbu, 2,800 m, 12. vii. 1987, leg. W. Thomas (ZFMK).



Figs 1–8. *Eupithecia* adults (scale bar=1 cm). 1. *E. olgae* Mironov, 1986. 2. *E. rubellata* Dietze, 1904. 3. *E. hemileuca* Hampson, 1895. 4. *E. ruficarpus* Warren, 1897 (holotype). 5. *E. phaea* sp. n. (holotype). 6. *E. interrubescens* Hampson, 1902 (holotype). 7. *E. dalhousiensis* sp. n. (paratype). 8. *E. mima* Mironov, 1989 (holotype).

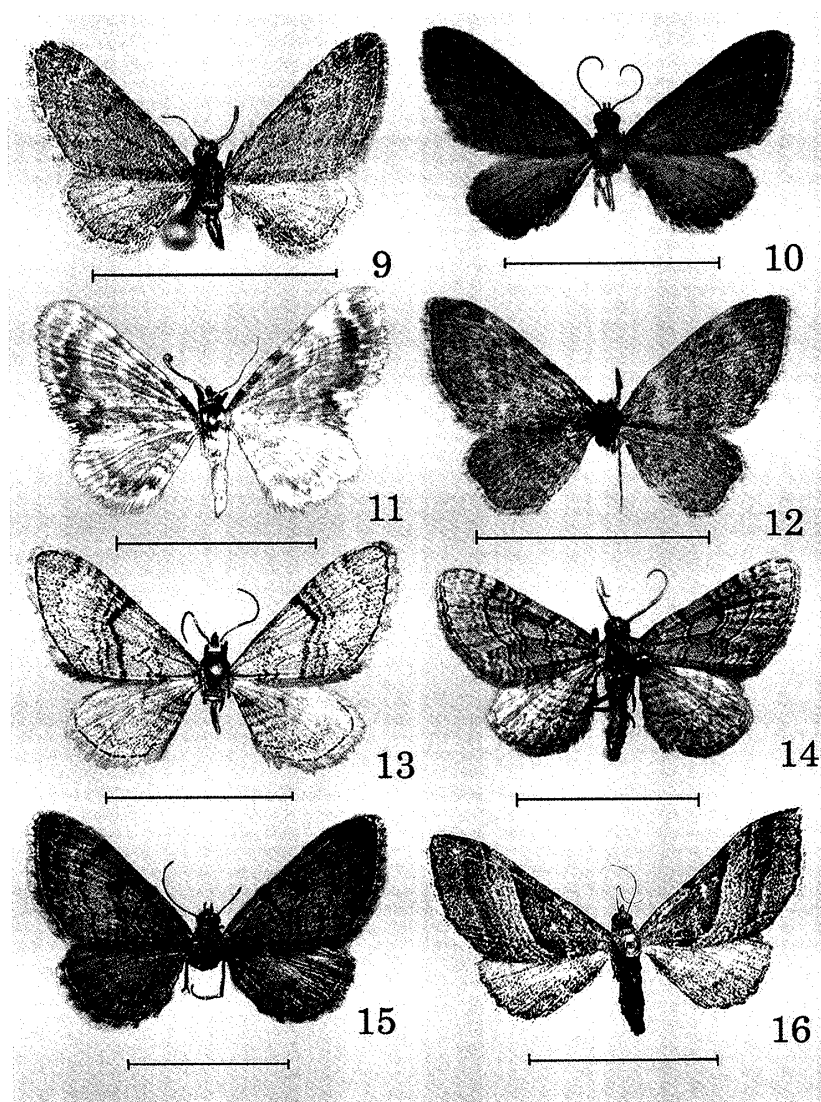
***Eupithecia olgae* Mironov, 1986 (Fig. 1)**

Eupithecia olgae Mironov, 1986, *Trudy Vses. ent. Obshch.* **67**: 96, figs 2a, b.

This species is known from the mountains of Uzbekistan, Tajikistan, Kirghizstan and Kazakhstan, and also occurs in south west China. A new species for the fauna of the Indian subcontinent.

Examined type material. ♀, Kirghizskaya SSR [Kirghizstan], Inner Tian-Shan, Naryn, 2030 m, 25. vii. 1983, at light, leg. V. Mironov (holotype, ZISP).

Recent material. 1 ♂ 1 ♀, Indien, J & K, Ladakh, vic. Lotsun, 3,000 m, 17. vii. 1986, leg. W. Thomas (ZFMK); 2 ♂ 1 ♀, same locality, 31. vii. 1986, leg. W. Thomas (ZFMK).



Figs 9–16. *Eupithecia* adults (scale bar=1 cm). 9. *E. pamirica* Viidalepp, 1988. 10. *E. thomasi* sp. n. (holotype). 11. *E. ochracea* Warren, 1888. 12. *E. vinibua* sp. n. (holotype). 13. *E. karli* sp. n. (holotype). 14. *E. carpophilata* Staudinger, 1897. 15. *E. bestia* sp. n. (holotype). 16. *E. lineosa* Moore, 1888.

***Eupithecia rubellata* Dietze, 1904 (Fig. 2)**

Eup(ithecia) rubellata Dietze, 1904, *Dt. ent. Z. Iris* **16**: 337, pl. 3, figs 3–5.

Eup(ithecia) rubellata f. *deserticola* Dietze, 1910, *Biologie der Eupitheciën* **1**: pl. 73: 372.

Eup(ithecia) rubellata f. *mediopunctata* Dietze, 1910, *Biologie der Eupitheciën* **1**: pl. 73: 373.

Eup(ithecia) rubellata f. *scotaeata* Dietze, 1910, *Biologie der Eupitheciën* **1**: pl. 73: 374, 375.

Eupithecia invenusta Vojnits, 1977, *Acta zool. Acad. Sci. hung.* **23**: 472, figs 9, 11 (synonymised in Mironov, 1990).

This attractive and distinctive species occurs widely in central Asia. It has not previously been recorded from the subcontinent.

Examined type material. ♀, Sinin Tibet, (K. Dietze), slide no 1653.4, De Laever 1957, coll. Dietze in MNHU); ♂, Altyn-tag, Asia, ♂ (K. Dietze) (syntype of *E. rubellata deserticola*, coll. Dietze in MNHU); ♀, Aksu, Makan-Wüste, (K. Dietze) (syntype of *E. rubellata*

mediopunctata, coll. Dietze in MNHU); ♀, Ili, Kuldja, (K. Dietze) (syntype of *E. rubellata scotaeata*, coll. Dietze in MNHU); ♂, Mongolia, Gobi Altaj aimak, Chasat charjchan ul Gebirge, ca 20 km S von Somon Žargalant, 2,400 m, Exp. Dr Z. Kaszab, 1966, Nr. 695, 15. vii. 1966, Vojnits slide no 10552 (holotype of *E. invenusta*, TTM).

Recent material. 2 ♀, Indien, J & K, Ladakh, vic. Lotsun, 3,000 m, 13. vii. 1987, leg. W. Thomas (ZFMK); 2 ♂ 10 ♀, same locality, Miru, 3,700 m, 23. vii. 1987, leg. W. Thomas (ZFMK, ZISP).

***Eupithecia fletcheri* Prout, 1926**

Eupithecia fletcheri Prout, 1926, *Mem. Dep. Agric. India* (Ent.) **9** (8): 252.

E(upithecia) fletcheri f. *hypognampta* Prout, 1938, in Seitz, *Macrolepid. Wld* **4** (Suppl.): 184, pl. 16, fig. k.

Syn. n.

Not previously recorded from Pakistan. Habitus and male and female genitalia illustrated in Inoue (2000).

Examined type material. ♂, [India], Kumaon, Muktesar, 7,500 ft., 13. Sept. 1922, Fletcher coll., *Eupithecia fletcheri* Prout ♂ type, Brit. Mus. 1923-479 (holotype, BMNH); 2 ♂, [India], Dalhousie, May 1891, *Eupithecia fletcheri* f. *hypognampta* Prout ♂ type (syntypes of *E. hypognampta*, BMNH).

Recent material. 1 ♀, Pakistan, Prov. NW-Frontier, 35 km N of Murree, Ayubia NP, 2,450 m, 2. iv. 1999, leg. B. Benedek & A. Szabó (coll. Sommerer); 2 ♀, Pakistan, Azad Jammu & Kashmir, Thunian, 2,300–2,700 m, 25–30. viii. 2004, leg. V. Gurko (coll. Ratzel).

Remarks. The taxon *hypognampta* was originally described by Prout as a form of *E. fletcheri*. It was subsequently listed in Scoble *et al.* (1999) as a good species, as a result, we believe, of an error in the BMNH index rather than a conscious decision. We have examined the syntypes, and can find no significant differences from *E. fletcheri*.

***Eupithecia hemileuca* Hampson, 1895 (Fig 3)**

Eupithecia hemileuca Hampson, 1895, *Fauna Br. India* (Moths) **3**: 401.

This species is not represented in modern material which we have seen from Kashmir and adjacent territories. Only the original type specimen originates from the area under examination.

Examined type material. ♂, [India], Dalhousie, 92–98 Harford Coll. 13/4/91, *Eupithecia hemileuca* Hmps. type ♂, BM Geom. slide no 20137 (holotype, BMNH).

***Eupithecia jezonica* Matsumura, 1927**

Eupithecia jezonica Matsumura, 1927, *Insecta matsum.* **1** (4): 184.

Eupithecia viidaleppi Vojnits, 1981, *Annls hist.-nat. Mus. natn. hung.* **73**: 232, figs 16, 18 (synonymised in Mironov & Galsworthy, 2007).

Eupithecia catosophia Inoue, 1988, *Bull. Fac. domest. Sci. Otsu Wom. Univ.* **24**: 336, figs 9a–f (synonymised in Mironov & Galsworthy, 2007).

This is a widespread East Asian species ranging from north-eastern Pakistan to Japan (Hokkaido) in the north and to Yunnan province (China) and Taiwan in the south. *E. jezonica* was established by R. Sato (1995) as a good species: there is also a large series from the Far East of Russia (Primorje) in the collection of ZISP (Saint Petersburg).

Examined type material. ♂, S-Ussuri, 17. vii. 1976, Lazo rj., Benevskoje, Viidalepp, Metsaviir, Ruben L, *Eupithecia bohatschi* Stgr., det. Viidalepp, 1977, Vojnits slide no 11090 ♂ (holotype of *E. viidaleppi*, TTM); ♂, Yushin, Nan tou Hsien, Taiwan, 3–4. viii. 1987, A. Kawabe, BM Geom. slide no 16542 (holotype of *E. catosophia*, coll. Inoue in BMNH).

Recent material. 1 ♀, Nord Indien/Kumaon, Bhimtal (Nainital), 1,450 m, 9. ix. 1973, Lichtfang, leg. S. Richter, Vojnits slide no 12123 (as *E. likiangi*, SMNK, see also Vojnits, 1981b: 225); 1 ♂, Indien, J & K, Ladakh, Kharbu, 2,800 m, 12. vii. 1987, leg. W. Thomas (ZFMK); 1 ♀, Pakistan, Punjab, Environ d'Islamabad, Monts Makgala, alt. 990 m, 15/22. x. 1989, leg. F. Aulombard et J. Plante (ZFMK); 4 ♂, Pakistan, Azad Jammu & Kashmir, Thunian, 2,300–2,700 m, 25–30. viii. 2004, leg. V. Gurko, Ratzel slides nos GU23405/1m, GU24405/2m, GU26405/4m, GU25405/2m (coll Ratzel).

***Eupithecia ruficorporis* (Warren, 1897) (Fig 4)**

Tephroclystia ruficorporis Warren, 1897, *Novit. zool.* **4**: 230.

The species is known mainly from the Khasis and Eastern Himalayas. We know of no modern material from the area under study.

Examined type material. ♀, Type, Khasis, Oct 1896, nat. coll., *Tephroclystia ruficorporis* Warr. Type ♀, Rothschild Bequest BM1939-1 (holotype, BMNH).

Older material. 3 ♀, Rawalpindi, Punjab, NM /90 and 91, Meyrick coll., BM 1938-290 (BMNH).

Remarks. Inoue (2000) synonymised *Eupithecia albicans* Vojnits, 1981 with *ruficorporis*. This is however not correct: *ruficorporis* belongs to the *haworthiata* group, in which the uncus in the male genitalia is replaced by a lamellar plate. *E. albicans* however has a normal uncus and belongs outside this group. *Eupithecia albicans* is therefore restored as a bona species (**stat. rev.**). The figure in pl. 168, fig 13 of Inoue (2000) is of the holotype of *albicans*, not that of *ruficorporis*.

***Eupithecia maculosa* Vojnits, 1981**

Eupithecia maculosa Vojnits, 1981, *Acta zool. Hung.* **27**: 230, fig. 14.

Eupithecia flavitornata Herbulot, 1984, *Miscnea. Ent.* **50** (2): 43, figs 7, 11 (synonymised in Inoue, 2000).

This species has hitherto been known from Nepal and NE India, and is new for the fauna of Pakistan. The female is still unknown. The variation in size of the male is unusually large (wingspan from 18 to 24 mm, average: 20 mm, *n*=8). Habitus and male genitalia illustrated in Inoue (2000).

Examined type material. ♂, Nepal, Helmu Gebiet, Gusum, Banjyang, 2,600 m, 2. ix. 1967, leg. Dierl (holotype of *E. maculosa*, ZSM); ♂, Nepal, 20 km SSE de Katmandu, route du Phulchoki, 2,400 m, 3. x. 1983, leg. C. Herbulot (holotype of *E. flavitornata*, ZSM).

Older material. 1 ♂, Kashmir Valley, 7,000 ft, August 1903, Coll. Ward, Rothschild bequest BM 1939-1, BM Geom slide 20953 (BMNH).

Recent material. 2 ♂, Pakistan, Azad Jammu & Kashmir, Thunian, 2,300–2,700 m, 25–30. viii. 2004, leg. V. Gurko, Ratzel slides nos GU24405/1m, GU28405/m (coll Ratzel).

***Eupithecia albigutta* Prout, 1958**

Eupithecia albigutta Prout, 1958, *Bull. Br. Mus. nat. Hist. (Ent.)* **6** (12): 393.

Eupithecia pulla Vojnits, 1988, *Acta zool. hung.* **34**: 38, pl. 2, figs G–H; figs 1–3, 10 (synonymised in Inoue, 2000).

Originally known only from the Himalayas, this species has now been reported from Taiwan, and is probably conspecific with *dolia* West from the Philippines (Mironov and Galsworthy, 2007). Habitus and male and female genitalia illustrated in Inoue (2000).

Examined type material. ♀, [India], Simla, 7,000 ft., Oct. '97, Pilcher, 99-206, *Eupithecia albigutta* Prout ♀ type, BM Geom. slide no 20139 (holotype of *E. albigutta*, BMNH); ♂, E Nepal, Sagarmatha Solukhumbu, Thame Og, 3,800 m, 1–2. x. 1979, M. Owada, Vojnits slide no 14655 (holotype of *E. pulla*, NSMT).

Older material. 1 ♀, Kashmir, Gulmarg, 21. vii. 1931, T. Bainbridge Fletcher, BM 1949-488 (BMNH).

Recent material. 1 ♀, Pakistan, Himalaya Mts., Kaghan valley, Tathabaya, 73°26'E, 34°36'N, 2,200 m, 19. v. 1998, leg. Gy. M. László & G. Ronkay (TTM); 1 ♂, Pakistan, Kashmir, Himalaya Mts., Nathiagali, Baragali Campus, 73°21'51"E, 34°05'47"N, 2,350 m, 24. vii. 1998, leg. G. Csorba & L. Ronkay (TTM).

***Eupithecia ustata* Moore, 1888/*delaeveri* Vojnits, 1976**

Eupithecia ustata Moore, 1888, *Descr. new Indian lepid. Insects Colln late Mr W. S. Atkinson* (3): 268.

Eupithecia delaeveri Vojnits, 1976, *Acta zool. hung.* **22**: 201, figs 1a, 2c, 3c.

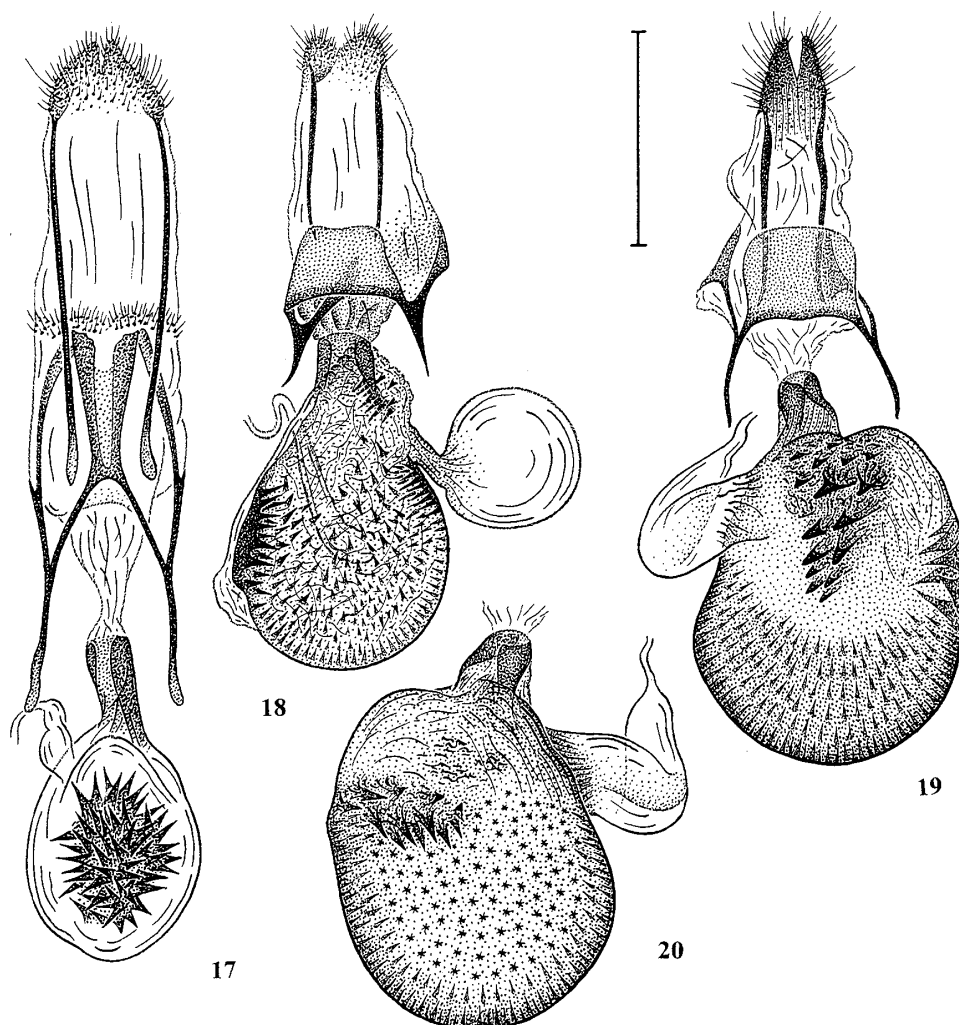
There are 6 specimens, detailed below, standing under *ustata* Moore in the collection of the Natural History Museum, London, which come from the area under study: they were almost certainly identified as *ustata* in the first half of the twentieth century, probably by Prout. These appear to be identical to one of the paratypes of *delaeveri* Vojnits, which we have examined, as do other specimens in the same series. We have not yet traced the holotype of *delaeveri*. *Eupithecia ustata* was based on a specimen or specimens from Sikkim which had passed from the collection of Mr Atkinson into that of Dr Staudinger. We have not so far succeeded in tracing type material of this species, which should be in the Staudinger collection in MNHU, Berlin. We are therefore unable at this stage to say whether the BMNH series is correctly identified, and hence whether *ustata* and *delaeveri* are synonymous.

Type material examined. ♀, paratypus *delaeveri* Vojnits, A-tun-tse (Nord-Yünnan), Talsohle ca 3,000 m, 31. v. 1937, H. Höne.

Older material. 1 ♀, Simla 7,000 ft., A. E. Jones, BM 1931-101; 2 ♂, India, Punjab, Khyra Gully, v and vi. 1881, H. Roberts coll., BM 1926-395; 1 ♂, Kashmir Valley, 4. viii. [19]02, 7,000 ft., coll. Ward, BM Geom slide 20312; 1 ♂ 1 ♀, Masuri, 3 and 4. x. [19]21, Rothschild bequest, BM1939-1.

***Eupithecia phaea* Mironov & Galsworthy, sp. n. (Fig 5)**

♀. Diagnosis. Wingspan 19 mm; fore wing 9.5 mm. Fore wing rather elongate, costa slightly arched, termen evenly curved and prominent medially; ground colour pale whitish grey; costal margin with three oblique dark, brownish grey spots; transverse lines (basal, antemedial and medial) narrow, brownish grey, inconspicuous; postmedial line marked by a series of dark dashes on the veins and sharply angulated near costa; terminal line narrow, brown, interrupted by veins; discal dot small, ovoid, brownish black. Fringes chequered



Figs 17–20. Female genitalia of *Eupithecia* species (scale bar=1 mm). 17. *E. phaea* Mironov & Galsworthy, sp. n. 18. *E. vinibua* Mironov & Galsworthy, sp. n. 19. *E. thomasi* Mironov & Galsworthy, sp. n. 20. *E. thomasi* Mironov & Galsworthy, sp. n. (corpus bursae from ventral side).

dirty white and grey. Hind wing with a shallow hollow in terminal margin, its ground colour as fore wing; transverse lines inconspicuous except basal and postmedial, which marked by a series of elongated dark, brownish grey dashes; discal dot small, rounded, brownish black; terminal line and fringes as fore wing.

Female genitalia (Fig. 17). Bursa copulatrix small, ovate, membranous, covered with two small central patches of large spines on the lateral walls. Ductus bursae indistinct. Ductus seminalis broadened basally, attached to posterior part of corpus bursae near base of colliculum on right side. Colliculum collar-like, elongate, and relatively broad. Antrum long, membranous, with transverse row of dense setae behind posterior margin of eighth tergite. Tergite A8 trapezoid, very long and narrow, slightly broadened to posterior margin, consisting of two sclerotized lateral bands, medially connected with each other by a membrane. Anterior and posterior apophyses very long, relatively thin, but expanded and flattened near apices; spurs of anterior apophyses very long, thin, slightly broadened at apices. Papillae anales short and broad, sharply narrowed to apex, with nipple-shaped apices, covered by

medium-sized setae.

Male unknown.

Similar species. This species belongs to the *tenuiata* group. Externally similar to the European *Eupithecia tenuiata* (Hübner, 1813) but distinguished from it by the larger size, the lighter, whitish colour and by the more oblique dark costal spots. The female genitalia of both species are also similar in general pattern. However, those of *E. phaea* are nevertheless very easily distinguished by the smaller corpus bursae with two separate patches of large spines on the lateral walls, the shorter colliculum, the longer anterior apophyses and apically less expanded anterior and posterior apophyses, and by the broader papillae anales.

Holotype. ♀, NW-Karakorum, Hunza-Nagar Kuto, Darukush, 36°32' n. Br., 74°14' ö. L., 3,300 m, 29. vii–1. viii. (19)59, leg. F. Lobbichler (ZSM).

Remarks. The single known specimen is rather worn.

Eupithecia subrubescens (Warren, 1888)

Cidaria subrubescens Warren, 1888, *Proc. zool. Soc. Lond.* **1888**: 329.

Melanippe despicienda Butler, 1889, *Illustr. typical Specimens Lepid. Heterocera Colln Br. Mus.* **7**: 24, 117, pl. 137, fig. 17.

Horisme subrubescens: Prout, 1938, in Seitz, *Macrolepid. Wld* (Suppl.) **4**: 212, pl. 17: e; Prout, 1941, *op. cit.* **12**: 353.

Habitus and male genitalia illustrated in Inoue (2000).

Examined type material. ♂, Berham Gully, 24/9/86, Berham Gully, 86-128, *C. subrubescens* Warr. Type (holotype of *C. subrubescens*, BMNH); 3 ♂, Dharmasala 87-59 (486), *Melanippe despicienda* Butler type (syntypes of *M. despicienda*, BMNH).

Recent material. 2 ♂ 3 ♀, [India], Punjab, Himalaya m. Occ., Simla, 2,500 m, Juli (ZFMK); 1 ♀, same locality, Berg Kufri, Juli (ZFMK); 1 ♂, India, Bhagwantpur, Dehra Dun (ZFMK); 1 ♂, Indien, Kumaon-Himalaya, Nainital Distr., Bhimtal, 1,450 m, 5. vi. (19)73, leg. Smetacek (SMNK); 1 ♂ 2 ♀, Pakistan, SW-Himalaya, Indus-Kohistan, Kaghantal, Naran, 3,000–4,500 m, 16. vii–5. viii. (19)77, leg. De Freina (SMNS); 2 ♂, Indien, Himachal Pradesh, Kullu valley, oberh. Kullu, 31°57'N, 77°09'E, 1,500 m, 22. x. 1990, leg. H. Hacker (ZFMK); 1 ♀, Indien, Himachal Pradesh, Parvati valley, 4 km NO Bhutar, 32°00'N, 77°14'E, 1,300 m, 24. x. 1990, leg. H. Hacker (ZFMK); 2 ♂ 1 ♀, Pakistan, Kohistan, Swat prov., Miandam, 72°32'E, 35°10'N, 1,800 m, 25. vi–5. vii. 1992, leg. Z. Weidenhoffer (ZFMK); 2 ♂ 3 ♀, same locality, Marghazar, 72°21'E, 34°46'N, 1,300 m, 6. vii. 1992, leg. Z. Weidenhoffer (ZFMK); 1 ♂ 1 ♀, Pakistan, Himalaya Mts, Kaghan valley, 20 km NE Balakot Tathabaya, 73°25'E, 34°41'N, 2,400 m, 25. vii. 1994, leg. B. Herczig, Gy. M. László & G. Ronkay (TTM); 1 ♂ 2 ♀, same locality, Tathabaya, 73°26'E, 34°36'N, 2,200 m, 16. v. 1998, leg. Gy. M. László & G. Ronkay (TTM); 1 ♂, same locality, Tathabaya, 73°25'91"E, 34°35'33"N, 2,150 m, 9. vii. 1998, leg. G. Csorba & L. Ronkay (TTM); 2 ♂, Pakistan, Kashmir, Himalaya Mts, 30 km N Murree, Ayubia, 73°24'03"E, 34°01'75"N, 2,650 m, 5–6. vii. 1998, leg. G. Csorba & L. Ronkay (TTM); 2 ♂ 10 ♀, same locality, near Nathia Ghali, Ayubia vill., 2,600 m, 20. vi. and 10. vii. 2000, leg. Varga & Ronkay (ZFMK, ZISP).

Remarks. This species, along with several apparently related species, including *brevifasciaria* Leech, *eurytera* Prout, and *sternecki* Prout, was included in *Horisme* by Prout (1938), but it was restored to *Eupithecia*, in our view correctly, by Inoue (1987). The other species mentioned above remain in *Horisme* for the time being, but it is likely that they also belong

in *Eupithecia*.

***Eupithecia interrubescens* (Hampson, 1902) (Fig 6)**

Phibalapteryx interrubescens Hampson, 1902, *J. Bombay nat. Hist. Soc.* **14**: 513.

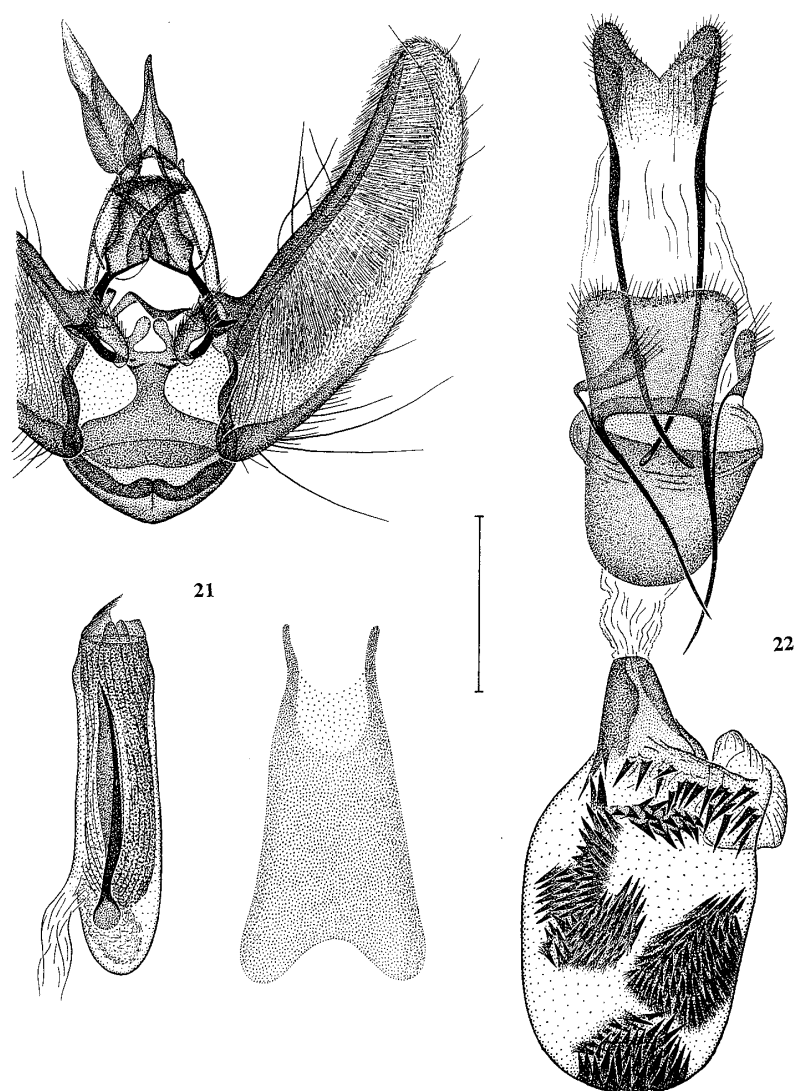
Examined type material. ♀, [China], Yatung, Tibet, A. E. Hobson, 98-201, *Phibalapteryx interrubescens* Hmps., Type ♀, BM Geom. slide no 2941 (lectotype, here designated, BMNH); paralectotypes, here designated: 1 ♂, Yatong, Tibet, A. E. Hobson 98-201 BM Geom slide no 2942; 1 ex., Sikkim, 95-146, Dudgeon, Yatong 1894 (*sic*).

Recent material. 1 ♀, Pakistan, SW-Himalaya, Indus-Kohistan, Kaghuntal, Naran, 2,400–3,000 m, 27. vii–6. viii. 1977, leg. de Freina (SMNS); 2 ♂ 4 ♀, same locality, 2,400–2,800 m, 21–22. vii. 1979, leg. W. Thomas (SMNS); 1 ♂, Indien, J & K, Ladakh, Fatu La-Paß, 3,800 m, 28+29. vii. 1980, leg. J. Weiss (SMNS); 1 ♀, Indien, Kashmir, Gulmarg, 2,800 m, 9+10. viii. 1980, leg. W. Thomas (SMNS); 1 ♀, Kashmir, Srinagar, Alt. 1,600 m env., 4. vii. (19)82, coll. J. Plante (coll. Herbulot in ZSM); 2 ♀, Pakistan, Gilgit, Naltar, 3,000–3,200 m, 19–23. vii. 1982, leg. Eckweiler (SMNS); 1 ♀, Pakistan, NW Frontier, Durga Gali, 2,100 m, 17. vii. 1979, leg. W. Thomas (SMNS); 1 ♂, same locality, Nathin Gali, 2,300 m, 28. vii–2. viii. 1979, leg. W. Thomas (SMNS); 1 ♀, NO-Pakistan, Murree-Hills, Jhika Gali, 2,300 m, 25–31. v. 1977, leg. de Freina (SMNS); 6 ♂ 7 ♀, Pakistan, Kashmir, Himalaya Mts, 30 km N Murree, near Nathia Ghali, Ayubia vill., 2,600 m, 20. vi and 10. vii. 2000, leg. Z. Varga & G. Ronkay (ZFMK, ZISP); 3 ♂ 1 ♀, Pakistan, Kashmir, Himalaya Mts, Deosai Mts, Bubin village, 74°59'E, 35°12.6'N, 3,150 m, 1–2. vii. 2000, leg. Z. Varga & G. Ronkay (ZFMK).

Remarks. Hampson's original description makes it clear that he had a number of specimens before him when preparing it, almost certainly including the specimen designated below as holotype of the next species, since he refers to a specimen from Dalhousie which is "more uniform red-brown": his text makes it clear that he based his description principally on specimens from Yatong (Yadong, in Tibet close to the border with Sikkim). Although he refers in the singular to "Type in BM", not enough information is given in the text to identify which of the three specimens from Yatong, two of which at least appear to have been collected at the same time, he had in mind. One bears the type label, but in the absence of confirmation in his published text, all three specimens must be regarded as syntypes. In order to ensure stability of the name, we therefore now designate the specimen bearing the type label as lectotype, and the two other specimens from Yatong as paralectotypes.

***Eupithecia dalhousiensis* Mironov & Galsworthy, *sp. n.* (Fig 7)**

Diagnosis. Wingspan. Male ($n=4$) 24–29 mm, female ($n=4$) 30–37 mm. Fore wing: male 14–18 mm, female 16–22 mm. Fore wing ground colour pale brown to fawn. Basal line narrow and zigzag, acutely angled on M_1 . A narrow dark brown fascia between basal and postmedial lines, also angled. Antemedial double, the outer line heavier, rounded on M_1 , and broadened at junction with costa, to form a streak close to discal dot. Latter large, dark brown, elongate. Medial line double, crenellate, faint, the two lines running parallel, except where they diverge to surround the discal dot. Postmedial double, the inner similar to the medial lines, crenellate, the outer much heavier, double angled at upper and lower margins of discal cell, and broadened at meeting with costa. Externally to this a pale fascia crossed by a further faint transverse line. Terminal area largely darker brown with variable pale areas, crossed by a crenellate pale submarginal line. Terminal line dark brown, broken at vein ends. Fringes brown. Hind wing ground colour as fore wing. Transverse lines present as a series of concentric wavy brown lines, except postmedial, which is heavier and sinuous,



Figs 21–22. Male and female genitalia of *Eupithecia dalhousiensis* Mironov & Galsworthy, sp. n. (scale bar=1 mm). 21. Male. 22. Female.

with two broad outward curves. Same pale fascia with faint line external to this; terminal area, submarginal, terminal lines and fringes as forewing.

Male genitalia (Fig. 21). Uncus long and narrow, uniapical. Valve long and narrow, slightly broadened in basal half, narrowed at apex into a gentle curve. Sacculus thickened and lightly sclerotized, costa strongly sclerotized. Vinculum broad, curved, with a marked angle at centre. Papillae on the anterior arms of labides stout, broadened at apex. Projections of juxta with two flat hornlike prominences. Aedeagus large, long and proportionately narrow, slightly shorter than valve. Vesica armed with a single long cornutus with a marked bulb at the base, and numerous denticles. Sternite A8 trapezoid, terminating apically in two rods. Basal emargination broad and curved, apical emargination deeper, also curved and partially occupied by membrane.

Female genitalia (Fig. 22). Bursa copulatrix long oval, membranous with two circular patches of large spines close to anterior end, and a longer curved patch on side wall, terminating in a transverse tail. Ductus seminalis attaching to bursa close to colliculum, broad, with numerous large spines at entrance. Colliculum large and heavily sclerotized, expanded

towards bursa. Ductus bursae relatively short. Antrum heavily sclerotized, forming an inverted triangle with rounded apex. Tergite A8 trapezoid, expanding to posterior edge, the latter sinuous. Anterior and posterior apophyses relatively narrow, posterior pair slightly thickened at apex. Papillae anales long and stout, each lobe well developed.

Similar species. The species belongs to the *abietaria* group. Confusion is most likely with *E. interrubrescens*, the only other species of a similar size. Externally the two species are very similar, and both are also confusingly variable. *E. interrubrescens* has the hind wing postmedial broader, and it stands out better against a paler background. The antemedial line on the fore wing of *dalhousiensis* is at an oblique angle where it joins the costa, and is marked by a strong dark streak, whereas in *interrubrescens* it meets the costa either at or close to a right angle. In the male genitalia, the cornutus in the aedeagus of *interrubrescens* is strongly sinuous and narrow, whereas in *dalhousiensis*, it is straight and blade-like, with an expanded bulb at the base. Sternite 8 in *dalhousiensis* has longer and narrower apical arms. In the female genitalia, *dalhousiensis* has the sides of the antrum parallel, whereas in *interrubrescens* they are sinuous; the pattern of spining in the bursa is also different: in *dalhousiensis* there is a large patch of spines at the anterior end of the bursa, lacking in *interrubrescens*, and the former has a much larger area of longer spines in the entrance to the ductus seminalis.

Holotype. ♀, [India], Dalhousie N.W. Amalnym, Moore Coll. 94-106, *Phibalapteryx interrubrescens* ab. *dalhousiensis* Strand, type ♀, BM Geom. slide no 2944 (BMNH, originally syntype of *E. interrubrescens*). Paratypes. 1 ♀, India Simla 7,000 ft A E Jones BM1931-101; 1 ♂, Goorais Valley June 1887 J H Leech BM Geom. slide no 2940; 1 ♂, Murree 19. v. 76, CIBC gc19-75152 CIE coll. A11222, Pres. by Comm. Inst. Ent., BM 1979-1 *Eupithecia dalhousiensis* Strand det J. D. Holloway, 1979, larva feeding in cone of *Pinus griffithii*; 1 ♀, Snogran 14. v. 70 CIBC FP8/69-B-43A, M. Anwar, CIE coll. A3870, Pres. by Comm. Inst. Ent., BM 1970-1 BM Geom. slide no 7705, larva feeding in *Pinus wallichiana* cone; 1 ♀, Murree, 17. v. 76 CIBC GC/10-75159 CIE coll. A11222, Pres. by Comm. Inst. Ent. BM1979-1, *Eupithecia dalhousiensis* Strand det J. D. Holloway, 1979 larva feeding in cone of *Pinus griffithii*; 1 ♂, Snogran 15. v. 70 CIBC FP9/69-B-56A, M. Anwar, CIE coll. A3870, Pres by Comm. Inst. Ent. BM 1970-1, *Eupithecia dalhousiensis* det D. S. Fletcher 1970, larva feeding in *Pinus wallichiana* cone; 1 ♂, Dungagali, 18. v. 70, CIBC FP9/69-B-49A, M. Anwar, CIE coll. A3870, Pres. by Comm. Inst. Ent., BM 1970-1 BM Geom slide no 7704, *Eupithecia dalhousiensis* Str. det D. S. Fletcher 1970, larva feeding in *Pinus wallichiana* cone.

Biology. Information on the labels of a number of the paratypes given above indicates that the larvae feed in the cones of species of *Pinus*.

Remarks. Strand (1917) published the name *dalhousiensis* as an ab., apparently solely on the basis of Hampson's having mentioned in his description of *interrubrescens* a specimen from Dalhousie which was more uniformly red-brown, and without himself seeing the specimen. The name was subsequently mentioned by Prout (1938), also as an ab. As such, it is not a valid name under the code. Having established that the specimen in question is in fact specifically distinct from *E. interrubrescens*, we have decided to describe the taxon using the same name.

***Eupithecia lucigera* Butler, 1889**

Eupithecia lucigera Butler, 1889, *Illustr. typical Specimens Lepid. Heterocera Colln Br. Mus.* 7: 24, 115, pl. 137, fig. 11.

This species ranges from the Western Himalayas to southern China. We have not however seen recent material from the area under study. Habitus and male and female genitalia illustrated in Inoue (2000).

Examined type material. ♂, [India], Dharmsala 87-59, *Eupithecia lucigera* Butler type, BM Geom. slide no 3518 (lectotype, here designated, BMNH); paralectotype, here designated. 1 ex., Dharmsala 87-59.

Older material. 1 ♂, Bhimtal, Muktesar 5–6,000 ft. 4. 9. 1922; 1 ♂, India, Ranikhet, 6,300 ft., 23. vii. 1938, Major J. A. Graham, BM 1938-614, BM Geom slide 21765; 1 ♂, NW India, Kasauli, H. J. W. Barrow, 12. 7. 1899, 1907-44; 1 ♂, same details, BM Geom slide no. 3519; 3 exs, Dalhousie, June 1891; 12 exs, Subathu [Himachal Pradesh], India, July 1889, BM Geom slide no 20927 ♀ (all BMNH).

Remarks. Butler did not designate type material, nor state how many specimens he had before him. He simply gives the locality as Dharmsala. The two specimens listed above are the only two in the BMNH series which date from the right period and come from the right locality. Since they were acquired at the same time from the same collector it is reasonable to assume that they are both syntypes. In order to ensure stability of the species, we designate the dissected specimen, which bears the BMNH type label, as lectotype, and the second specimen as paralectotype.

***Eupithecia mima* Mironov, 1989 (Fig 8)**

Eupithecia mima Mironov, 1989, *Vestnik Zool.* **1989** (3): 14, figs 3a–d.

This species has been recorded hitherto from Uzbekistan, Kazakhstan and Mongolia. Not previously recorded from Pakistan.

Examined type material. ♂, Mongolia: Bayan-Khongor aimak, 140 km S of Shine-Dzhinst, Ekhn-Gol Oasis, 23. vi. 1981, leg. A. Lvovsky, Galsworthy & Mironov slide no 540 (holotype, ZISP).

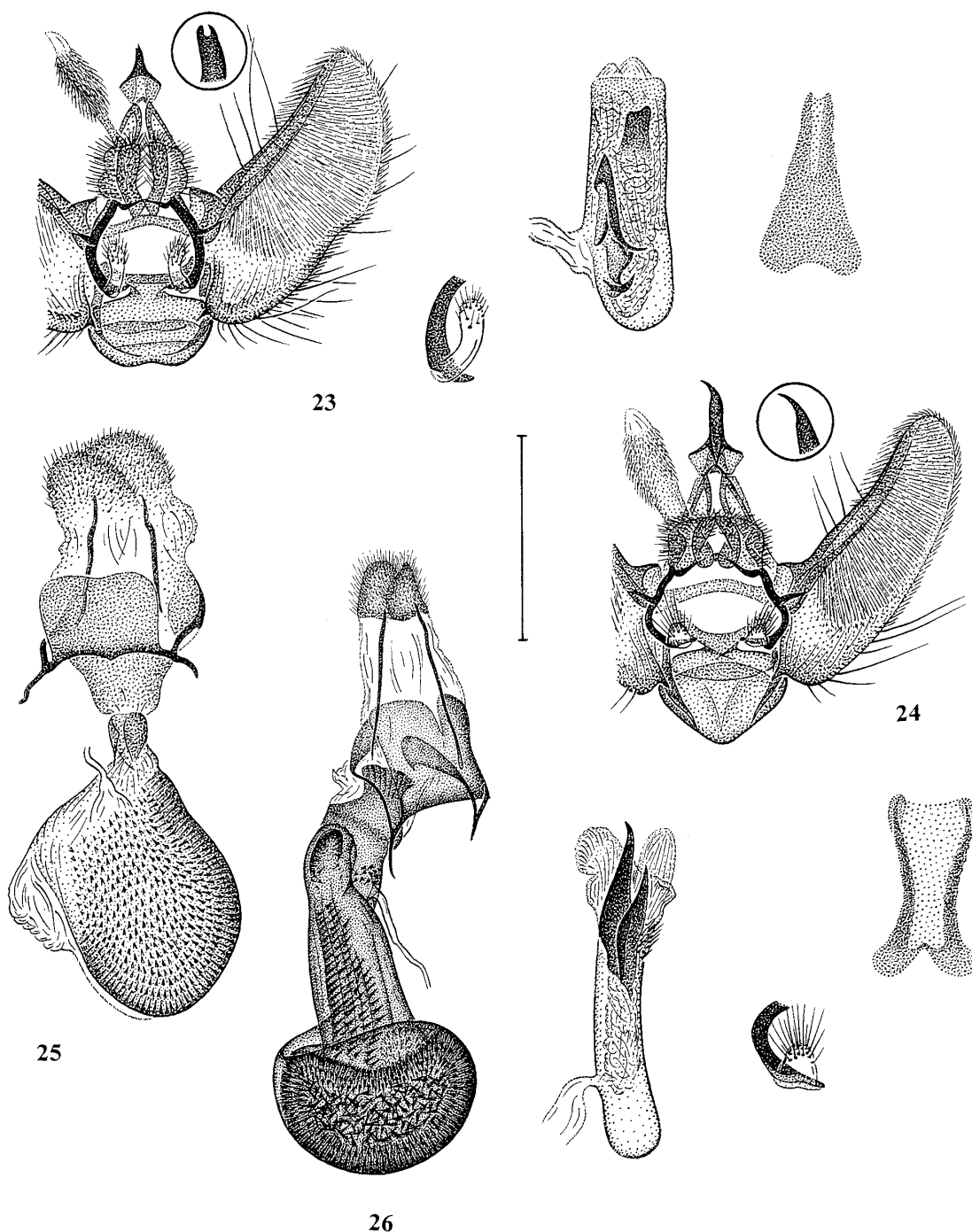
Recent material. 1 ♂ 1 ♀, N-Pakistan, 20 km E of Gupis, 36°15'N, 73°36'E, 2,500 m, 20. vi. 1992, leg. M. Hreblay & G. Csorba; 1 ♂, Pakistan, Margalla Hills, 20 km N Islamabad, Pir Sohawa, 72°55'E, 33°50'N, 600 m, 8. vii. 1994, leg. B. Herczig, Gy. M. László & G. Ronkay (TTM); 2 ♀♀, Pakistan, Karakoram Mts, 50 km N of Gilgit, Chalt, 74°20'14"E, 36°15'20"N, 1,850 m, 11. vii. 1998, leg. G. Csorba & L. Ronkay (TTM); 1 ♀, Pakistan, Hindukush Mts, 20 km E of Gupis, 2,100 m, 73°37.6E 36°15'6N, 8. viii. 1998 leg. Z. Varga & G. Ronkay (coll. László).

***Eupithecia pamirica* Viidalepp, 1988 (Fig 9)**

Eupithecia pamirica Viidalepp, 1988, *Fauna pyadenits gor Srednej Azii* [Geometridae fauna of the Central Asian mountains]: 117, pl. 2, fig. 14; text-pl. 26, figs 14–17 (nec text-pl. 25, figs 8–11 and text-pl. 32, fig. 11).

This Central Asian montane species was described from Tajikistan (Darvazsky Mts, Ghissarsky Mts and SW Pamirs) and Kyrghizstan (Tchatkal Nature Reserve). It has not previously been recorded from Pakistan. It flies from late July to early September at altitudes above about 1,800 m (in Darvazsky and Ghissarsky Mts) up to about 3,500 m (in Deosai Mts) above sea level.

Examined type material. ♀, [Tadjikistan], Darwaz, south slope, Visharvi river, 1,800 m, 8–9. viii. 1958, (leg.) A. Bundel (holotype, ZISP).



Figs 23–26. Male and female genitalia of *Eupithecia* species (scale bar=1 mm: males with sternite A8, and lateral view of uncus and papillae on the anterior arms of labides enlarged). 23. *E. thomasi* Mironov & Galsworthy, sp. n., male. 24. *E. karli* Ratzel & Mironov, sp. n., male. 25. *E. karli* Ratzel & Mironov, sp. n., female. 26. *E. bestia* Mironov & Galsworthy, sp. n., female.

Recent material. 1 ♂, Pakistan, Deosai Mts, near Chilim, 3,500 m, 17. viii. 2004, leg. V. Gurko, Ratzel slide no GU12705/2m (coll. Ratzel); 5 ♂ 8 ♀, Pakistan, Great West. Himalaya Mts, near Gabar, 3,200 m, 21–24. viii. 2004, leg. V. Gurko, Ratzel slides nos. GU11707/3w, GU12705/1w, GU29805/1m, GU15805/4w, GU15805/5w (coll. Ratzel); 1 ♂, Pakistan,

Karakoram Mts, Naltar Valley, 2,800 m, 74°12'E 36°09'6N, 18. vii. 1998, leg. G. Csorba & L. Ronkay (coll. László).

***Eupithecia thomasi* Mironov & Galsworthy, sp. n. (Fig 10)**

Diagnosis. Wingspan 14.5–15.5 mm; fore wing 7.5–8.5 mm. Fore wing slightly elongate and narrowed, costa slightly arched, apex narrow, pointed; ground colour light brown; transverse lines showing in paler buffy brown; antemedial line oblique, straight, sharply angled in cell; medial double, sinuous, curving round outside of elongate black discal spot; postmedial running approximately parallel to it, until sharply angled outwards close to costa; costal margin with four darker spots (basal, antemedial, postmedial and apical); terminal area narrow, darker, with a narrow, wavy, light subterminal line and a small pale tornal spot; terminal line narrow, black, interrupted by veins. Fringes chequered light and dark ochreous grey. Hind wing with shallow medial hollow in terminal margin; ground colour lighter, pale ochreous grey; anal margin and tornus darker, brownish grey with indistinct transverse lines; discal dot rounded, paler and smaller than on the fore wing; terminal line and fringes as fore wing.

Male genitalia (Fig. 23). Uncus small, short and stout, biapical. Valve rather broad, with obvious but shallow medial hollow in ventral margin and rather broadly rounded apex; sacculus thickened, lightly sclerotized. Vinculum short, rounded at angles and flat at apex. Papillae on the anterior arms of labides small, slightly elongate, clavate, covered by short setae in apical half. Aedeagus small and relatively short, shorter than length of valve. Vesica armed with one short, broad, apically blunt, plate-like cornutus, also with a narrow, curved U-shaped cornutus and one relatively large, curved irregular cornutus near ductus ejaculatorius base. Sternite A8 peg-like, small, narrow and elongated, tapered to apex, with two apically tapered parallel apical arms; basal hollow shallow; apical hollow membranous, very narrow, deep, about 1/2 length of sternite.

Female genitalia (Figs 19, 20). Bursa copulatrix elongate oval, constricted at middle, covered with slim spines in anterior half, with a group of larger, stout marginal spines with wrinkled bases on the left and ventral sides, and also with a separate patch of similar smaller, stout spines with wrinkled bases on the dorsal side from colliculum to the middle of corpus bursae. Ductus bursae very short and narrow, with small oblique striations. Ductus seminalis broad, especially broadened at base, sharply curved backwards, attached to posterior part of corpus bursae near colliculum on right side. Colliculum collar-like, small, short and narrow, inclined to right. Antrum short, membranous. Tergite A8 small, rectangular, with narrowly sclerotized anterior margin and rounded posterior corners. Anterior and posterior apophyses relatively short and thick. Papillae anales sclerotized, small, narrow and elongate, tapered to apices, with longitudinal striations, covered with medium-sized soft setae.

Similar species. This species is most similar externally to *E. mustangata* Schütze, 1961. However, *E. thomasi* sp. n. can usually be distinguished easily from the latter by its generally smaller size, the browner tinge of the wings and by the transverse lines on the wings appearing pale against the darker background colour, and much less clear cut. The genitalia are clearly distinguished from *E. mustangata* by the broad and blunt apical plate-like cornutus on the vesica and broader apical arms of the eighth sternite in the male, as well as the shorter apophyses and eighth tergite, and the shape of the corpus bursae with different disposition of spines in the female genitalia.

Holotype. ♂, Indien, WB Darjeeling, Tigerhill, 2,400 m, 29–31. viii. 1988, leg. W. Thomas

(ZFMK). Paratypes. 4 ♂, same locality (ZFMK; ZISP); 2 ♂, Indien, J & K, 15 km östl. Drass, 3,000 m, 26. vii. 1988, leg. W. Thomas (ZFMK); 1 ♂ 1 ♀, Nepal, 17 km SSE Katmandu, Route du Phulchoki, 1,750 m, 28. ix. 1983, C. Herbulot (coll. Herbulot in ZSM); 3 ♂, India U.P., Naini Tal, 6,600 ft., 31. viii and 2 and 15. ix. 1934, J. A. Graham BM1934-514 and 648, BM Geom slide 21839; 1 ♂ 3 ♀, Kumaon, Muktesar 7,500 ft., Sept 1922, Fletcher coll., BM Geom slides 21480 and 21506 (f); 1 ♂ 1 ♀, Sikkim, ix. 1909, F. Moller, 1910-140 (BMNH).

Derivatio nominis. The name of this species is dedicated to Dr Werner Thomas (Bad Nauheim, Germany), who collected moths intensively in Northern Africa, Turkey, Iran, Afghanistan, Pakistan, India and many other places. Werner Thomas was only 45 years old when he died on February 28th, 1991, at a time when he intended to intensify his entomological activities (see Nässig, 1993).

Eupithecia mustangata Schütze, 1961

Eupithecia mustangata Schütze, 1961, *Veröff. zool. StSamml. Münch.* **6**: 181, pl. 29, figs 4, 9; pl. 31, fig. 4; pl. 32, fig. 1.

Eupithecia emikoeae Inoue, 1996, *Trans. lepid. Soc. Japan* **47**: 237, figs 1, 2, 8, 11. **Syn. n.**

This is one of the more common and variable Himalayan species of *Eupithecia*. It was first recorded from Kashmir as *E. emikoeae* Inoue, 1996. While the holotype of *E. emikoeae* is certainly conspecific with *mustangata*, some of the paratypes (at least 1 ♂ and 1 ♀ which were presented by Dr H. Inoue to the ZISP collection) belong to the preceding species *Eupithecia thomasi* Mironov & Galsworthy, sp. n. Habitus and male and female genitalia were illustrated in Inoue (2000).

Examined type material. ♂, Nepal, Mustangbhot, 29°11'N.Br., 83°58'Ö.L., Muktinath, 3,500 m, 5. viii. (19)55, leg. F. Lobbichler (holotype of *E. mustangata*, ZSM); ♂, NW India, Kashmir, Pahalgam-Kolohoi, Lidderwat (3,000 m), 8–9. viii. 1982, leg. E. Yoshimoto, BM Geom slide no 22012 (holotype of *E. emikoeae*, coll. Inoue in BMNH).

Older material. 1 ♀, Kokser, H. M. McArthur coll., July 1888; 1 ♀, Goorais Valley, Sept 1887, J. H. Leech, Leech coll. 1900-64; 1 ♂, Kashmir Valley, 7,000 ft., August 1903, Coll. Ward, Rothschild bequest, BM 1939-1, BM Geom slide 21532 (BMNH).

Recent material. 1 ♀, NW Pakistan, Prov. Swat, 15 km nördl. Kalam, Gabral-Tal, 2,100 m, 6–9. vii. 1969, leg. Vartian, Vojnits slide no 15091 (TTM); 1 ♀, Pakistan, Kaghan, Naran, 2,400 m, 26–27. vii. 1975, leg. W. Thomas (coll. Sommerer); 1 ♂, Indien, J & K, Ladakh, Tangol, 3,100 m, 22 and 26. vii. 1980, leg. W. Thomas (SMNS); 4 ♂ 4 ♀, Indien, J & K, Kashmir, Sonamarg, 2,700 m, 10–11, 25, 27 and 28. vii. 1987, leg. W. Thomas (ZFMK); 1 ♂ 4 ♀, same locality, 2,900 m, 25. vii and 13. viii. 1988, leg. W. Thomas (ZFMK); 2 ♂, same locality, vic. Gund, ca 2,200 m, 14. viii. 1988, leg. W. Thomas (ZFMK); 2 ♀, Indien, J & K, Ladakh, vic. Lotsun, 3,000 m, 25. vii. 1987, leg. W. Thomas (ZFMK); 1 ♂, Indien, J & K, Zaskar, Penai-La, 4,000–4,500 m, 12–17. vii. 1991, leg. W. Thomas (SMNS); 1 ♂, Indien (21), Himachal Pradesh, Spiti, Spiti Valley, 6 km SE Kaza, 4,100 m, 1. vii. (19)94, leg. P. Kautt & V. Weisz (ZMKU); 1 ♂ 2 ♀, Pakistan, Hindukush Mts, 5 km E of Shandur pass, 72°32'E, 36°10'N, 3,500 m, 13. vii. 1994, leg. B. Herczig, Gy. M. László & G. Ronkay (TTM); 11 ♂ 5 ♀, same locality, 72°38'E, 36°07'N, 3,750 m, 26–27. vi. 2000, leg. Z. Varga & G. Ronkay (ZFMK); 1 ♀, Pakistan, Himalaya Mts., 8 km SW Astor, 74°46'E, 35°16'N, 3,000 m, 18. vii. 1994, leg. B. Herczig, Gy. M. László & G. Ronkay (TTM); 4 ♂ 1 ♀, Pakistan, Himalaya Mts, 5 km S of Deosai Pass, 75°31'E, 35°16'N, 2,800 m, 21. vii. 1994, leg. B. Herczig, Gy. M. László & G. Ronkay (TTM); 1 ♂ 1 ♀, Pakistan, Himalaya

Mts, Kashmir, Deosai N.P., Chilam Chauki, 75°07'19"E, 35°02'16"N, 3,600 m, 14. vii. 1998, leg. G. Csorba & L. Ronkay (TTM); 26 ♂ 7 ♀, same locality, Deosai Plains, 75°12'14"E, 35°00'43"N, 3,950 m, 15. vii. 1998, leg. G. Csorba & L. Ronkay (TTM; ZISP); 1 ♂ 1 ♀, Pakistan, Kashmir, Himalaya Mts, Deosai Mts., Bubin village, 74°59'E, 35°12.6'N, 3,000 m, 16. vii. 1998, leg. G. Csorba & L. Ronkay (TTM); 2 ♀, same locality, 3,150 m, 1–2. vii. 2000, leg. Z. Varga & G. Ronkay (ZFMK); 1 ♂ 6 ♀, same locality, 75°02'E, 35°13.5'N, 3,300 m, 6. vii. 2000, leg. Z. Varga & G. Ronkay (ZFMK); 2 ♀, Pakistan, Karakoram Mts, Naltar valley, 74°09'22"E, 36°11'08"N, 2,900 m, 20. vii. 1998, leg. G. Csorba & L. Ronkay (TTM); 3 ♀, Pakistan, Deosai Mts, near Chilim, 3,500 m, 17. viii. 2004, leg. V. Gurko, Ratzel slides nos GU30805/4w+5w, GU1905/2w; 2 ♀, Pakistan, Great West. Himalaya Mts, near Gabar, 3,200 m, 21–24. viii. 2004, leg. V. Gurko, Ratzel slides nos 1905/3w+4w; 1 ♂, Pakistan, Azad Jammu & Kashmir, Thunian, 2,300–2,700 m, 25–30. viii. 2004, leg. V. Gurko, Ratzel slide no GU17905/3m (coll. Ratzel); 1 ♂, Pakistan, Kashmir, Himalaya Mts, Kashmir Deosai Plains, Deosai Pass, 4,250 m, 17. viii. 1998, leg. Z. Varga & G. Ronkay; 1 ♀, Deosai Plains, 3,650 m, 75°12'E 35°01'N, 4. vii. 2000, leg. Z. Varga & G. Ronkay; 1 ♀, Pakistan, Karakoram Mts, Naltar Valley, 2,800 m, 74°12'E 36°09'6"N, 18. vii. 1998, leg. G. Csorba & L. Ronkay (coll. László).

***Eupithecia ochracea* (Warren, 1888) (Fig 11)**

Asthenes ochracea Warren, 1888, *Proc. zool. Soc. Lond.* **1888**: 321.

Eupithecia nova Vojnits, 1974, *Acta zool. Acad. Sci. hung.* **20**: 219, figs 1a–e. Syn. n.

A distinctive species, similar only to *E. leucostaxis*, which ranges as far as southwest China.

Examined type material. ♀, Thundiani, 17/8/[18]86, Thundiani 86-128, BM Geom slide no 20091 ♀ (lectotype of *A. ochracea*, here designated, BMNH); ♂, China, Provinz Nord-Yuennan, Li-kiang, 7. ix. 1934, H. Höne (holotype of *E. nova*, ZFMK).

Older material. 1 ex., India, Punjab, Khyra Gully, v. 1881; 1 ex., Punjab, Khyra Gully road to Rawalpindi, 20–21. viii. 1881; 1 ex., Kumaon, Muktesar, 7,500 ft., Sept 1902; 1 ex., Mussoorie, J. M. C. Gardiner, 10. ix. 1928 (all BMNH).

Recent material. 3 ♂ 2 ♀, Pakistan, Azad Jammu & Kashmir, Thunian, 2,300–2,700 m, 25–30. viii. 2004, leg. V. Gurko, Ratzel slides nos GU30405/5m, GU4505/1w, GU5505/1m (coll Ratzel).

Remarks. Warren's original description was based on 2 females from Thundiani: only one of these is in the BMNH series. The whereabouts of the other is unknown, and we therefore designate the specimen detailed above as lectotype, in order to ensure stability of the name.

***Eupithecia vinibua* Mironov & Galsworthy, sp. n. (Fig 12)**

♀. Diagnosis. Wingspan 15.5 mm; fore wing 8.5 mm. Fore wing broad with arched costa, evenly curved termen and pointed apex; ground colour dark greyish brown; transverse lines inconspicuous; postmedial line visible as a pale fascia, multiply wavy; terminal area with inconspicuous whitish subterminal line and small light tornal spot; terminal line brown, continuous; discal dot invisible. Fringes short, whitish, shortly spotted by brownish at vein endings. Hind wing with shallow medial hollow in terminal margin; ground colour as fore wing; transverse lines inconspicuous; discal dot invisible also; terminal line and fringes as on the fore wing.

Female genitalia (Fig. 18). Bursa copulatrix pear-shaped, lightly sclerotized, thick-walled

and wrinkled, almost completely covered with sparse small spines, with row of larger spines along right side. Ductus bursae short, thick-walled, with wrinkled, prominent backward diverticulum on dorsal side, with short row of small spines at left side near base of colliculum, and with large, spherical, membranous diverticulum, which is narrowly attached to base of ductus bursae from left side. Ductus seminalis fairly narrow, sharply curved backward, attached to central part of corpus bursae on ventral side. Colliculum collar-like, rather short and narrow. Antrum membranous, covered with numerous pores. Tergite A8 small, trapezoid, with broadly sclerotized anterior margin and rounded posterior corners. Anterior and posterior apophyses short; anterior apophyses pointed, thorn-shaped, broadened near base of spurs; posterior apophyses thin, slightly broadened near base. Papillae anales small, rounded, covered by short setae.

Male unknown.

Similar species. On the basis of the large diverticulum to the bursa, this species is likely to belong to the *undata* group. It is very similar to *E. pygmaeata* (Hübner, 1799), but distinguished from this latter by the more pointed apex of the fore wing and by the presence of a shallow hollow in the terminal margin of the hind wing. The extent of the spiniferous area in the corpus bursae, the disposition of the globular membranous diverticulum near the base of the colliculum, and the narrower, collar-like colliculum in the female genitalia are all quite distinct from their equivalents in *E. pygmaeata*.

Holotype. ♀, Indien, J & K, Kashmir, Sonamarg, 2,700 m, 28. vii. 1987, leg. W. Thomas (ZFMK).

Remarks. The single specimen (holotype) is rather worn: the head has been broken off and stuck, without the antennae, to a separate label.

***Eupithecia karli* Ratzel & Mironov, *sp. n.* (Fig 13)**

Diagnosis. Wingspan 19–20 mm; fore wing 10–10.5 mm. Labial palpi covered with grey scales. Frons, vertex and nothum dirty white. Fore wing relatively narrow and elongate with straight costa, more or less narrow, pointed apex and evenly curved termen; ground colour unicolorous grey or pale grey; transverse lines blackish brown, inconspicuous, except for three (sometimes two) medial lines, which leave the costa at a right angle, and run almost straight to the lower edge of the disc, where they are acutely angled, thence running almost straight to inner margin; basal and antemedial lines narrow, dentate, grouped close together; postmedial line narrow and inconspicuous; light subterminal line absent; terminal line narrow, continuous, blackish brown; discal spot relatively large, oblique, broad and elongate, intensely black. Fringes short, chequered dirty white and pale grey. Hind wing ovoid with narrow apex; ground colour as fore wing or only slightly lighter; transverse lines blackish brown, well marked along anal margin only; terminal area narrow, usually darker; discal dot paler, elongate and narrow, comma-like; terminal line and fringes as fore wing. First and second abdominal segments dirty white, third segment with black transverse band, the other abdominal segments grey.

Male genitalia (Fig. 24). Uncus long and relatively thin, uniapical. Valve elongate, narrow, with almost parallel dorsal and ventral margins, and rather narrowly rounded apex; sacculus lightly sclerotized. Vinculum tapered to apex. Papillae on the anterior arms of labides short and broad, covered with long setae. Aedeagus short and slim, shorter than length of valve. Vesica armed with two long, medially broadened horn-like cornuti, pointed to apices. Sternite A8 two elongate, narrow lyre-shaped arms, slightly broadened and blunt at apices, connected with each other by a very short and narrow basal band; basal hollow relatively

deep; apical hollow membranous, broad and very deep.

Female genitalia (Fig. 25). Bursa copulatrix small, ovoid, almost completely covered with dense small spines, with a broad, prominent membranous diverticulum on right side. Ductus bursae short and narrow. Ductus seminalis slightly broadened at base; attached to ductus bursae near colliculum on dorsal side. Colliculum collar-like, short and narrow. Antrum short and broad, lightly sclerotized. Tergite A8 short and broad, with heavily sclerotized and medially convex anterior margin and rounded posterior corners. Anterior and posterior apophyses very short, thin. Papillae anales relatively large, broad, rounded, covered with numerous short setae.

Similar species. There is no doubt that this species belongs to the *venosata* group. *E. karli* can be distinguished easily from other species of this group by the unicolorous grey ground colour of the fore wing with three well-marked (sometimes only one or two well visible) medial transverse lines, the first (inner) medial of which is thicker than the others and crosses obliquely the elongate discal spot. The male genitalia of *E. karli* are most similar to those of *E. silenicolata* Mabille, 1867, but distinguished from them by the shorter vinculum and two rather broader horn-like cornuti on the vesica of the aedeagus. The female genitalia of *E. karli* have a narrower colliculum than *E. silenicolata*, and a membranous lateral diverticulum (sclerotized in *E. silenicolata*). They also lack a membranous diverticulum at the base of the ductus bursae.

Holotype. ♀, Indien, J & K, Ladakh, Fatu-La, 3,700 m, 7 and 8. vii. 1981, leg. W. Thomas, Ratzel slide no GU 2905/2w (SMNS). Paratypes. 1 ♀, Indien, J & K, Ladakh, 15 km ö Drass, 3,000 m, 16. vii. 1986, leg. W. Thomas (ZFMK); 2 ♀, Indien, J & K, Ladakh, vic. Lotsun, 3,000 m, 13. vii. 1987, leg. W. Thomas (ZFMK); 1 ♂, Pakistan, Kashmir, Himalaya Mts, Deosai Mts, Bubin village, 74°58'E, 35°12.6'N, 3,150 m, 19. vi. 1998, leg. Gy. Fábíán & B. Herczig (TTM); 1 ♀, Pakistan, Himalaya Mts, Nanga Parbat area, Astor, Rama, 74°48'E, 35°21'N, 3,300 m, 13. vii. 1998, leg. G. Csorba & L. Ronkay (TTM).

Derivatio nominis. This species is dedicated to Karl Ratzel—the father of Ulrich Ratzel.

Eupithecia carpophilata Staudinger, 1897 (Fig 14)

Eupithecia *carpophilata* Staudinger, 1897, *Dt. ent. Z. Iris* **10**: 108, pl. 3, fig. 69.

(*Eupithecia*) *carpophilata* var. *collega* Dietze, 1908, *Dt. ent. Z. Iris* **21**: 199 (non binomial).

A new species for the fauna of India.

Recent material. 1 ♂, Indien (31), Himachal Pradesh, Spiti, Spiti Valley, Kaza, 32°13'N, 78°05'E, 3,600 m, 8. vii. 1994, leg. P. Kautt & V. Weisz (ZMKU).

Remarks. Staudinger based his original description of this species on a male from Ussuri and an unsexed specimen from Spain: the Ussuri male was illustrated in a photographic plate with the paper. Subsequent discussion in various papers (Dietze 1904, 1908; Petersen 1910; Prout 1938) established that the specimen from Spain was an example of *E. alliaria* Staudinger, 1870. By the time these papers were written, abundant further material from Siberia was available, and Petersen's dissections established that the Siberian species was specifically separate from *alliaria*. We have examined a number of specimens in MNHU, Berlin, which derive from Staudinger's collection, but unfortunately have not found one which corresponds to the originally illustrated male. We therefore do not designate a lectotype: however there seems little doubt about the identity of the species, the genitalia of which were illustrated by Petersen (1909).

***Eupithecia bestia* Mironov & Galsworthy, sp. n. (Fig 15)**

♀. Diagnosis. Wingspan 22 mm; fore wing 12 mm. Fore wing broad with narrow, almost pointed apex, costa slightly bowed, terminal margin evenly curved; ground colour unicolorous, grey; all transverse lines distinct, blackish brown, broadened near costa; antebasal line straight, sharply angled onto costa; postbasal and antemedial lines parallel to each other, both twice curved between A and stalk of Cu and perpendicular to costa; two medial lines parallel to each other, right angled from discal dot onto costa; postmedial multiply wavy, evenly curved; terminal area slightly darker, with indistinct, narrow and wavy, pale subterminal line; terminal line narrow, black, interrupted by veins; discal dot relatively small, narrow and elongate, oblique, black; fringes short, chequered pale grey and grey. Hind wing broad, rounded; ground colour grey but slightly lighter; transverse lines inconspicuous except evenly rounded postmedial; terminal area slightly darker with indistinct pale subterminal line; discal dot smaller and paler, elongate; terminal line and fringes as on the fore wing.

Female genitalia (Fig. 26). Bursa copulatrix globular, completely and densely covered with small spines. Ductus bursae sclerotized, long and broad, slightly tapered to posterior, with some longitudinal striations, longitudinal rows of spines and with a small patch of spinules in the posterior part. Ductus seminalis short and thin, attached to ductus bursae near colliculum on right side. Colliculum wide, plate-like, sclerotized. Antrum membranous, short. Tergite A8 rectangular, short and broad, with narrow membranous gap in middle of posterior margin. Anterior and posterior apophyses short and thin. Papillae anales short, slightly tapered to apices, covered by short setae.

Male unknown.

Similar species. This species belongs to the *venosata* group. It is similar to *E. carpophilata* Staudinger, 1897, but the wings are broader, grey rather than brown, with darker transverse lines broadened near the costa, the antemedial and two medial lines following a different pattern, the discal dot on the fore wing larger and longer and the transverse lines on the hind wing less expressed, except the postmedial, which is entire in *bestia* but absent in the species compared. The female genitalia of *E. bestia* are similar to those of *E. carpophilata* in general pattern, but can be easily distinguished by the much broader ductus bursae and by the ring of spines in its posterior part.

Holotype. ♀, Pakistan, Karakoram Mts, Naltar valley, 2800 m, 74°12'E, 36°09.6'N, 18. vii. 1998, leg. G. Csorba & L. Ronkay, slide no GL72 (coll. László).

***Eupithecia lineosa* Moore, 1888 (Fig 16)**

Eupithecia lineosa Moore, 1888, *Descr. new Indian lepid. Insects Colln late Mr W. S. Atkinson* (3): 268. Syntype(s) (MNHU), [India]: Darjiling [=Darjeeling].

E(upithecia) lineosa gulmargensis Prout, 1938, in Seitz, *Macrolepid. Wld* 4 (Suppl.): 209, pl. 18, fig. e. **Syn. n.**

The Kashmirian subspecies *E. lineosa gulmargensis* Prout, 1938 was described on the basis of two specimens, one from Gulmarg, and one from an unspecified location in Kashmir. Having examined these specimens, and that detailed below, we do not believe that it is distinguishable from *lineosa*, and therefore synonymise *gulmargensis* with the latter.

Examined type material. ♂, Kashmir, Gulmarg, 19. vii. 31, Fletcher coll., Brit. Mus. 1932-13, *Eupithecia lineosa gulmargensis* Prout ♂ type (holotype of *E. lineosa gulmargensis*, BMNH); 1 ♀, allotype, Kashmir 6,000-8,500 ft.

Recent material. 1 ♀, Pakistan, Himalaya Mts, Kaghan valley, Tathabaya, 73°27'01"E, 34°36'48"N, 2,300 m, 22–23. vii. 1998, leg. G. Csorba & L. Ronkay (TTM).

Eupithecia leucostaxis Prout, 1926

Eupithecia leucostaxis Prout, 1926, *J. Bombay nat. Hist. Soc.* **31**: 318.

Eupithecia deprima Vojnits, 1974, *Acta zool. hung.* **20**: 223 (synonymised in Inoue, 2000).

A distinctive species ranging from southwest China through Myanmar to the western Himalayas. Habitus and male and female genitalia were illustrated in Inoue (2000).

Examined type material. ♀, Upper Burma: Hpimaw Fort, Nr. Myitkyina, 8,000 ft., 9–13. viii. 1923, Capt. A. E. Swann, *Eupithecia leucostaxis* Prout ♀ type, BM Geom slide no 20090 (holotype of *E. leucostaxis*, BMNH); ♀, (China), Provinz Nord-Yuennan, Li-kiang, 21. vii. 1935, (leg.) H. Höne (holotype of *E. deprima*, ZFMK).

Older material. 1 ex., Simla, vii. 1896; 1 ex., Thundiani, 19. ix. 1886; 1 ex., Rawalpindi, Punjab, 1891 (all BMNH).

Recent material. 3 ♂ 3 ♀, Indien, Uttar Pradesh, 15 km N Joshimath, Ghangaria, ca 3,050 m, 27–31. vii. 1993, leg. Kautt & Weisz, Lep1997-14 (SMNS).

Eupithecia contraria Vojnits, 1983

Eupithecia contraria Vojnits, 1983, *Acta zool. Acad. Sci. hung.* **29**: 263, figs 2, 4, 5.

Eupithecia fuscoferruginea Inoue, 1987, *Bull. Fac. domest. Sci. Otsuma Wom. Univ.* **23**: 239, figs 63F, 65A & B (synonymised in Inoue, 2000).

There is a large type-series of *E. contraria*, deriving entirely from Nepal, in the collections of ZSM (Munich) and TTM (Budapest). It has not previously been recorded from Pakistan. Habitus and male and female genitalia were illustrated in Inoue (2000).

Examined type material. ♂, Nepal, Tanga, 3,800 m, 29. vii. 1962, leg. G. Ebert u. H. Falkner, Vojnits slide no 11654 (holotype of *E. contraria*, ZSM); ♂, C. Nepal, Kalbani near Nilgiri, 8–11. vii. 1969, T. Miyashita leg. (holotype of *E. fuscoferruginea*, coll. Inoue in BMNH).

Recent material. 1 ♂, Pakistan, Himalaya Mts, Kaghan valley, 12 km E of Naran, Battakundi, 73°40'E, 34°57'N, 3,200 m, 26. vii. 1994, leg. B. Herczig, Gy. M. László & G. Ronkay (TTM).

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摘 要

西部ヒマラヤのカバナミシヤク属 I (V. MIRONOV · A. C. GALSWORTHY · U. RATZEL)

主にカシミール地方を中心に西部ヒマラヤのカバナミシヤク属 *Eupithecia* を再検討し, 80 種を認めた. 本報は 3 分割した第 1 報で, 6 新種 (*E. phaea* Mironov & Galsworthy, *E. dalhousiensis* Mironov & Galsworthy, *E. thomasi* Mironov & Galsworthy, *E. vinibua* Mironov & Galsworthy, *E. karli* Ratzel & Mironov, *E. bestia* Mironov & Galsworthy) の記載を含むほか, いくつかのシノニムを整理した. その中には, これまで日本で *E. tabidaria* Inoue として知られるハラキカバナミシヤクを含む. ハラキカバナミシヤクの学名は *E. subtacincta* Hampson, 1895 となるが, カシミールから沿海州, 日本にまで分布する広域種であることが分かった.

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